7

Program Applications

In This Chapter. . . .

A Quick Checkout of the Module

What It Does

The configuration shown below and the RLL on the adjacent page are not intended for actual application of the D4-HSC, but rather is shown as a means to quickly checkout the main functions of the module — namely its counting and output capability. In this configuration, we are using an internal special purpose relay (SP7) of the DL-405 to generate a low frequency pulse signal for the inputs of the D4-HSC. ***Direct***SOFT programming and its Watch Window capability can be used to monitor the counting and preset versus current count relationship. The color coding of **Direct**SOFT's ladder logic can show you the status of your various outputs. You can also visually watch the LED's of the module to witness all of these functions.

How It Works

It is assumed the HSC is in slot 0 and you have a sourcing DC output module in Slot 1. There is also an input module with a switch attached or an input simulator in Slot 2. Here is how the program works:

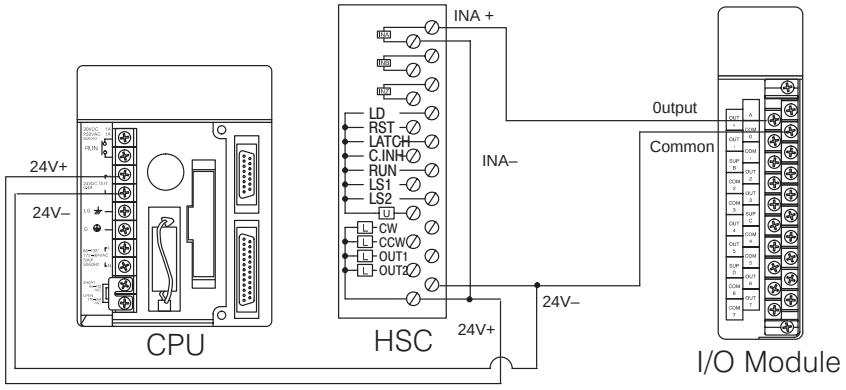
1. On power up, SP0 comes ON, loading your preset and deceleration values into the shared memory of the HSC.
2. When you turn on X20 (start switch) via the input module or simulator, Y12 sets the counter to zero.
3. When the counter is set to zero, X2 turns ON and this causes Y3 (HSC RUN mode) to be activated.
4. At this point, CW turns on because current count is less than preset. The HSC is constantly comparing the value of your current count with your preset.
5. When the count value equals your deceleration value, OUT1 will turn ON.
6. When current count and preset are equal, CW turns OFF and OUT2 (brake) turns ON.
7. At this point, X1 turns ON and Y40 stops pulsing. Y3 is also reset causing an exit of HSC RUN. You will notice that OUT1 and OUT2 stay ON even though we exit the HSC RUN mode. If you wish these to turn OFF before exiting, you will have to turn ON Y0 first, and then exit. The outputs will also reset when HSC RUN is invoked again.

Things You Need for the Example

This is a list of items that you will need in order to set up the Quick Checkout for the module:

- DL405 series CPU/Power Supply unit (DL430 or DL440)
- Mounting base for the above (with at least 3 empty slots)
- Any current sourcing DC output module
- D4-HSC module (mounted in Slot 0 of the base)
- Either an input simulator or an input module with switch attached

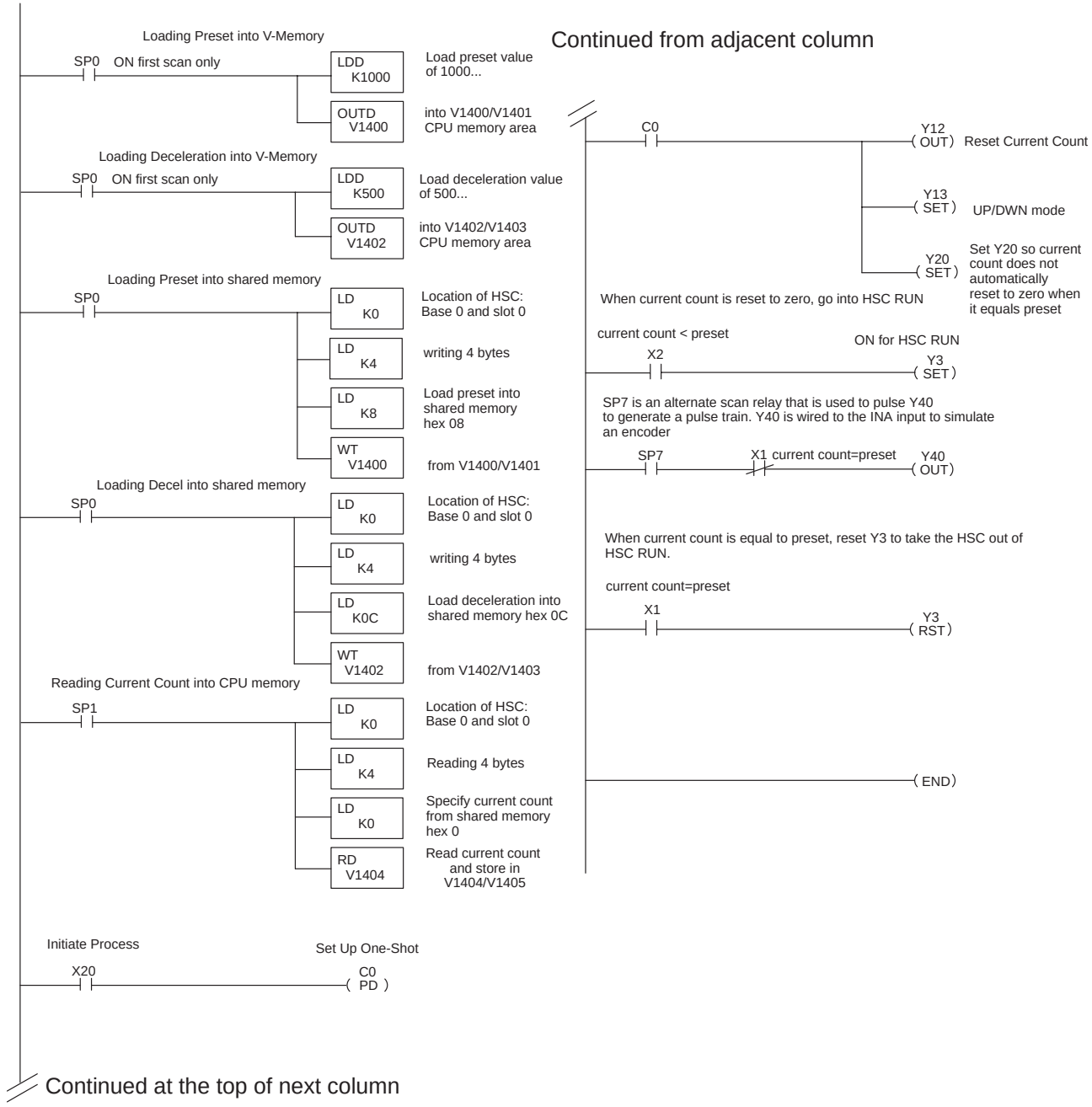
Wiring Diagram for Example



RLL Program for Quick Checkout of the Module

(Assumes the HSC is in Slot 0 of the Base 0.)

DirectSOFT Display



Application No. 1: Drilling Operation

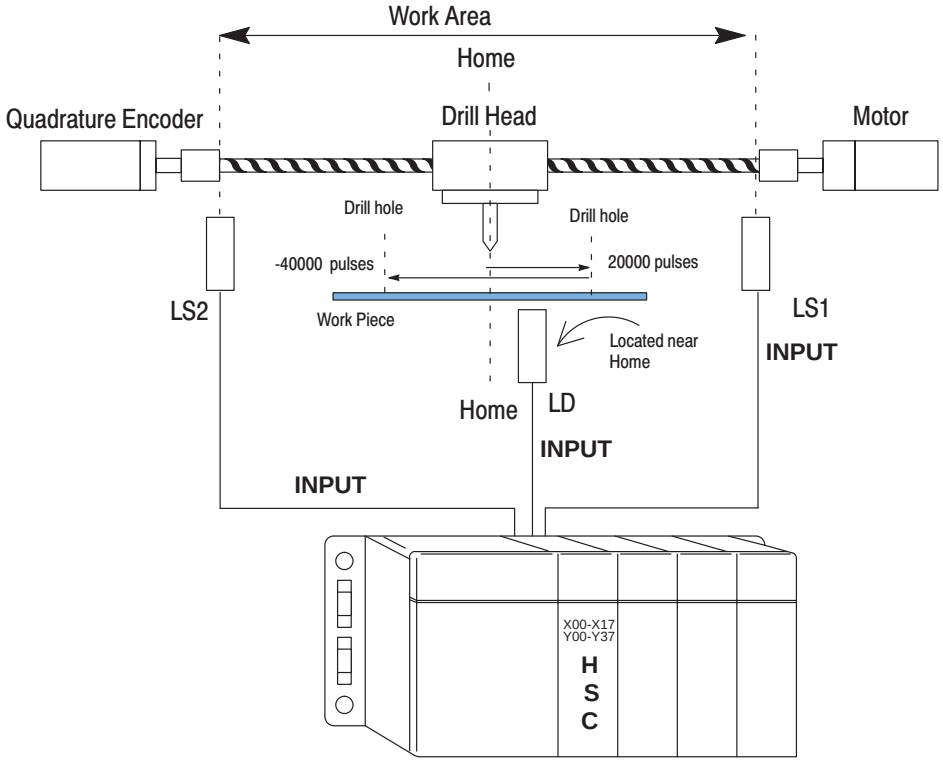
This application is designed to show you how multiple presets, negative presets and home search can be used in a program that drills holes in a work piece. The drill head is attached to a lead screw driven by a motor that is used with a quadrature encoder.

To simplify matters, we have placed the HSC in slot 0 of base 0. This means that X inputs and Y outputs of the HSC are automatically assigned X00 through X17 and Y00 through Y37. Refer to the I/O Configuration Table in Appendix B to find out what specific functions are assigned to each of these data points.

We are going to be drilling holes at two target areas (presets) 20000 pulses, and –40000 pulses. We will be using the Home Search feature to control the process. Since the position of the first hole drilled is keyed off of “home”, we will always execute Home Search when the second hole has been drilled. This helps eliminate inaccuracies in positioning caused by mechanical inaccuracies or false pulses being received.

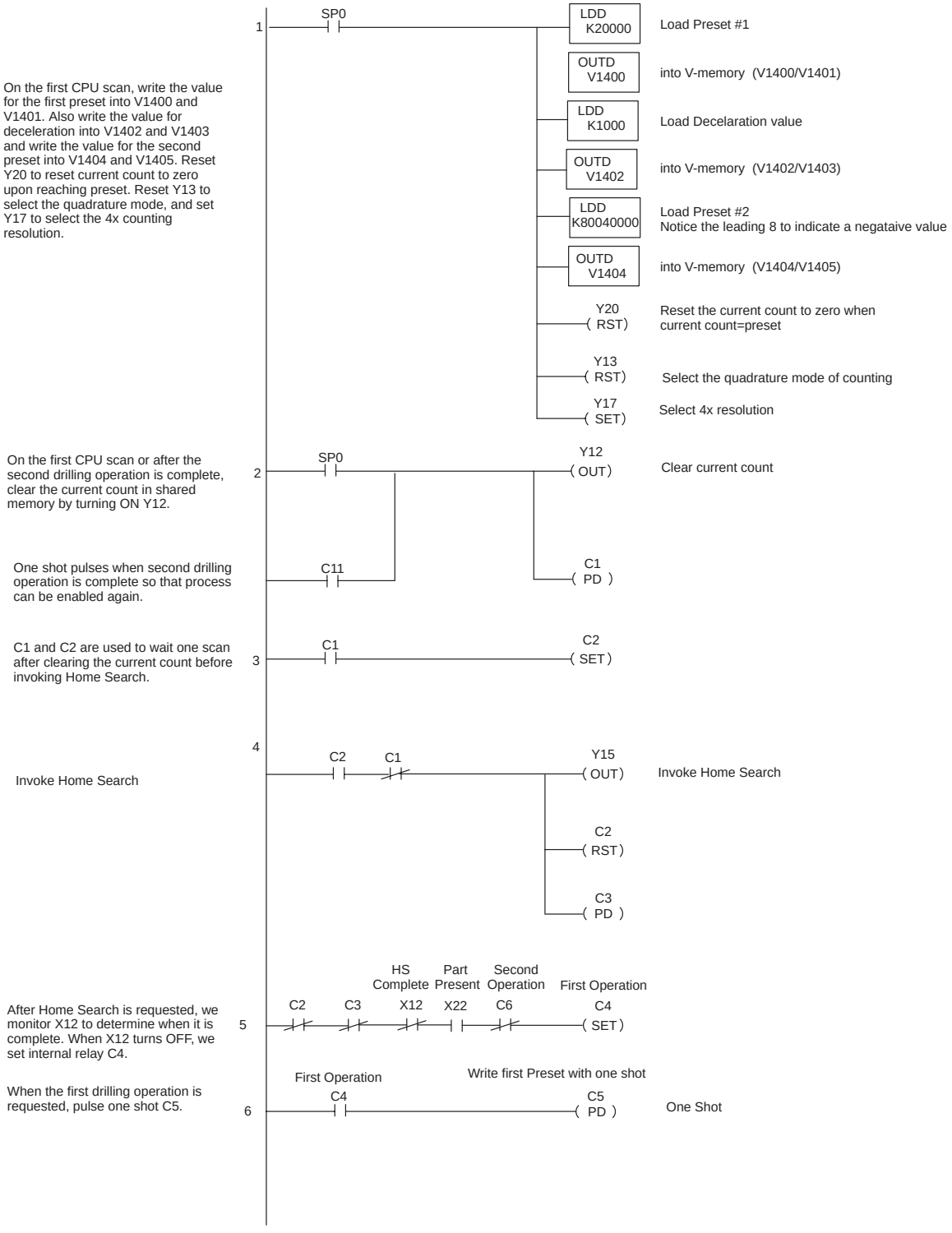
The sequence of events is as follows:

1. The drill is idle and in the raised position.
2. Home Search is enabled to make sure drill is positioned at Home.
3. X22 comes ON to indicate that the work piece is in position.
4. Turn ON HSC RUN and move in positive direction.
5. At 19000 pulses slow down the drill head, then stop at 20000. Lower the drill head and drill a hole.
6. Raise the drill head and move in a negative direction.
7. When the drill head is at –39000, slow down, then stop at –40000.
8. Lower the drill head and drill the second hole.
9. Raise the drill head, reset the outputs, and invoke Home Search again.



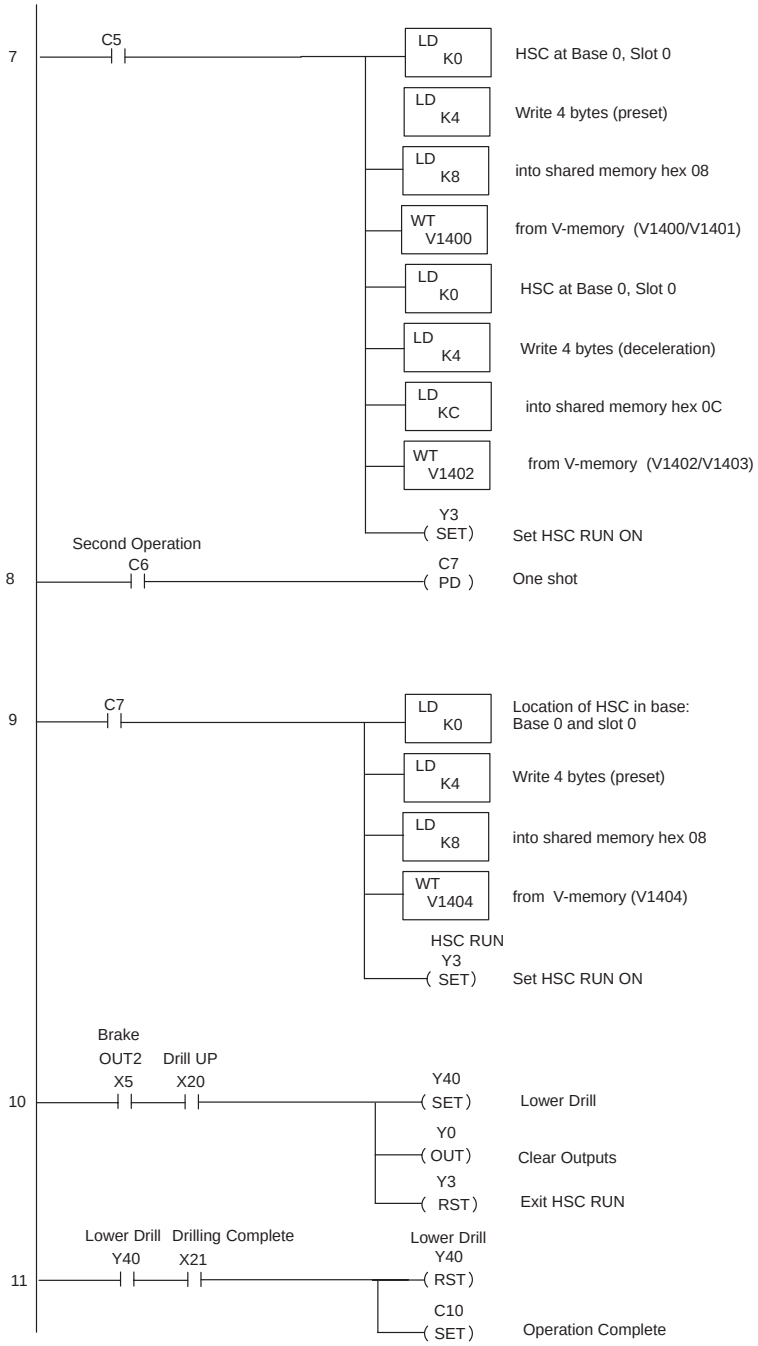
Ladder Logic for Drilling Operation

WARNING: This application is included as an example and should not be used for real-world applications. It does not contain any safety-related instructions, which could possibly be needed.



Continuation of Application No. 1

Write the preset and deceleration value for the destination of the first hole to shared memory and invoke HSC RUN.



When the second drilling operation is requested, pulse one shot C7.

Write the preset value for the destination of the second hole to shared memory and invoke HSC RUN.

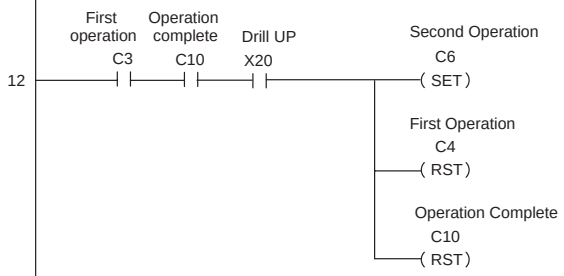
NOTE: We do not have to write a new deceleration value because we want to start deceleration at the same number of pulses from our preset value as in the first operation.

When the destination is reached, lower the drill by setting Y40. Clear the HSC's outputs by turning ON Y0 , and then exit HSC RUN by resetting Y3.

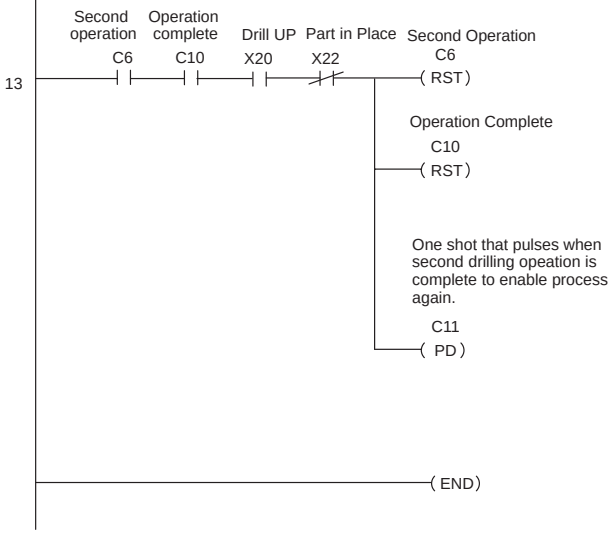
When the drill reaches the lower limit, X21 comes ON and resets Y40. This enables the drill to raise and sets Operation Complete bit C10.

Continuation of Application No. 1

When the first drilling is complete and the drill is in the raised position, enable the logic that loads the values into shared memory for the next operation by setting C6 and resetting C4, and reset the operation complete bit, C10.



With the second drilling operation is complete, the drill is in the raised position, and the part is removed, reset C6 and C10 and enable the logic that invokes Home Search by pulsing C11.



Application No. 2: Cut-to-Length Operation

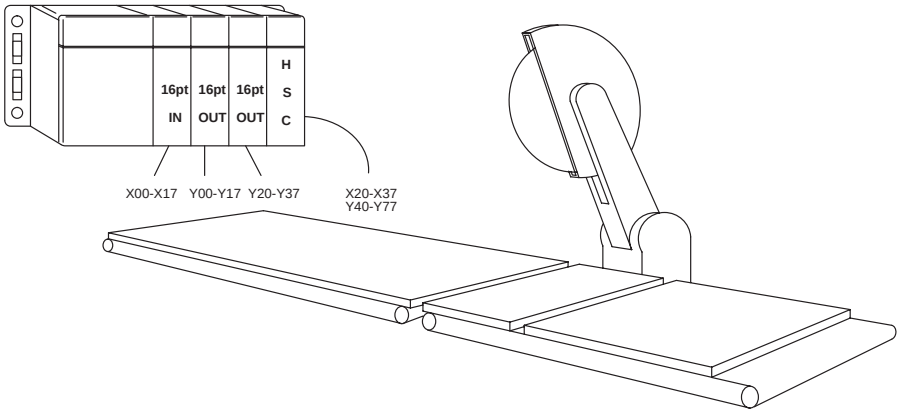
In this application, we have the HSC located in slot 3 of base 0. The I/O modules to the left of the HSC, consume data points X00 through X17 and Y00 through Y37. This means the data points assigned automatically to the HSC are X20 through X37 and Y40 through Y77. Refer to the I/O Configuration Table in the Appendix B of this manual to find out what functions of the HSC are assigned to these points.

We are cutting boards to length in this application. Our preset target in this case is 9,000 pulses, and the deceleration value is 500 pulses. We are using X2, a photoeye (not shown), to detect when a board has reached the work area. If a board is not present, the RLL program will advance the conveyor by turning ON Ym+6. When a board is detected, control of the conveyor will be transferred to the HSC which will automatically control the conveyor. This will immediately transfer control of the conveyor over to the HSC. Here's how it works:

1. When the photo beam is unbroken (X2 ON), CW output is turned ON to advance a board to the work area.
2. As soon as the photoeye detects a board, we clear the current count by pulsing Y52 (reset with Ym+12) and invoke HSC RUN by setting Y43 (Ym+3).
3. When current count reaches 8500 pulses, the deceleration (OUT1) is enabled; and when the current count reaches 9000 (equals preset) the brake (OUT2) is enabled. This stops the conveyor.
4. When OUT2 (brake) turns ON, X25 will turn ON (echoed value of OUT2). We use this input to clamp the board and enable the saw.
5. When the cut is complete, X3 will turn ON allowing the saw to retract and unclamp the board. X3 also resets the external outputs of the HSC and exits HSC RUN.
6. When the saw returns to its home position and a part is still present, the process will start over. If the photoeye turns OFF before we reach the target position, we will exit HSC RUN and once again advance the conveyor using Y46.

The boards in this application may be a variety of lengths. 9,000 pulses represent the length of board we want. If there are, say 3000 pulses per foot of board, our desired board length is 3 feet after the cutting. If a board trips the photoeye that is less than 3 feet in length, it is rejected and HSC RUN is not enabled. CW turns ON and a new board is advanced.

Notice also in the program that OUT1 and OUT2 have been wired to inputs of a drive that have been programmed to slow down the conveyor when a signal is received from OUT1 and brake when received from OUT2.



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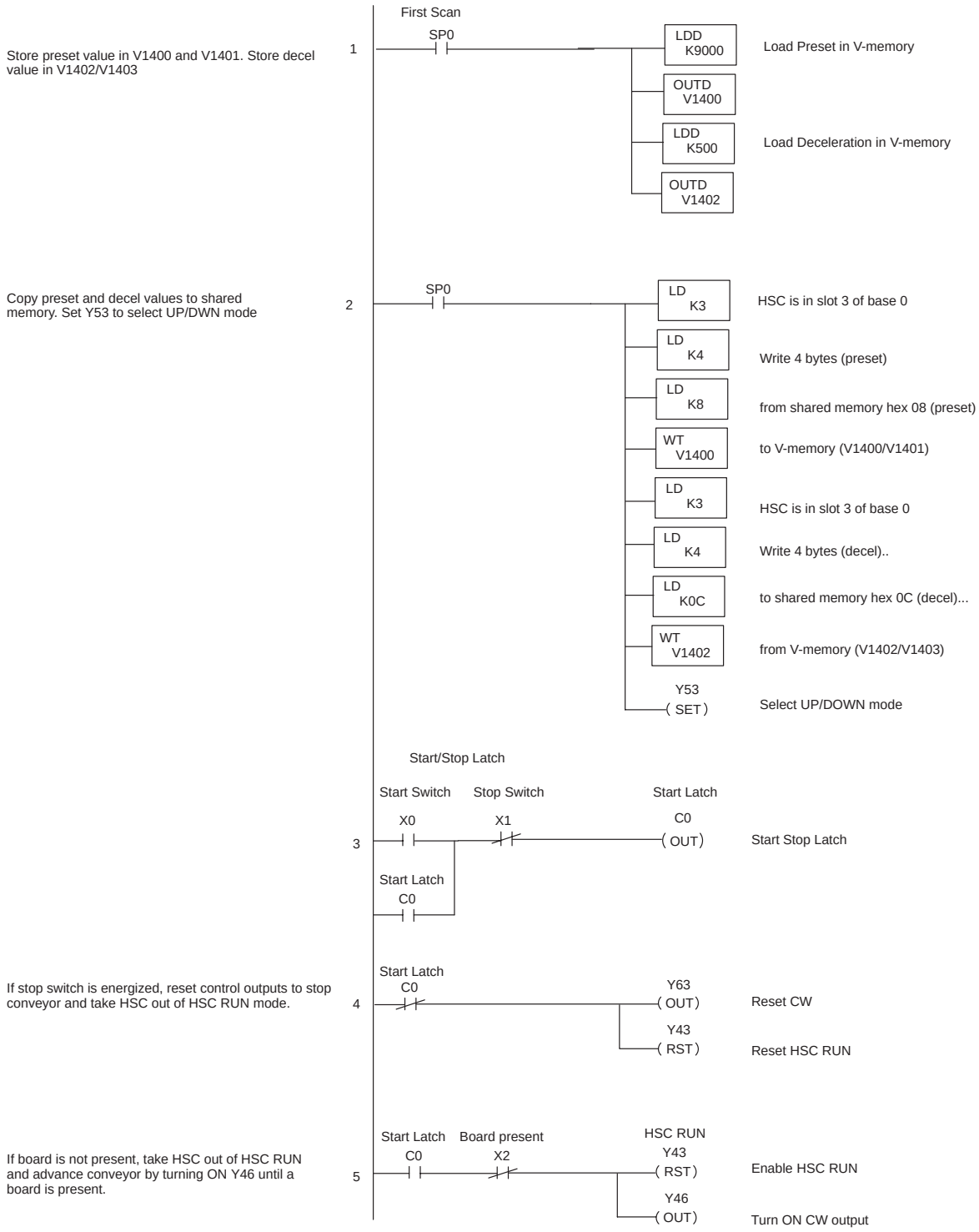
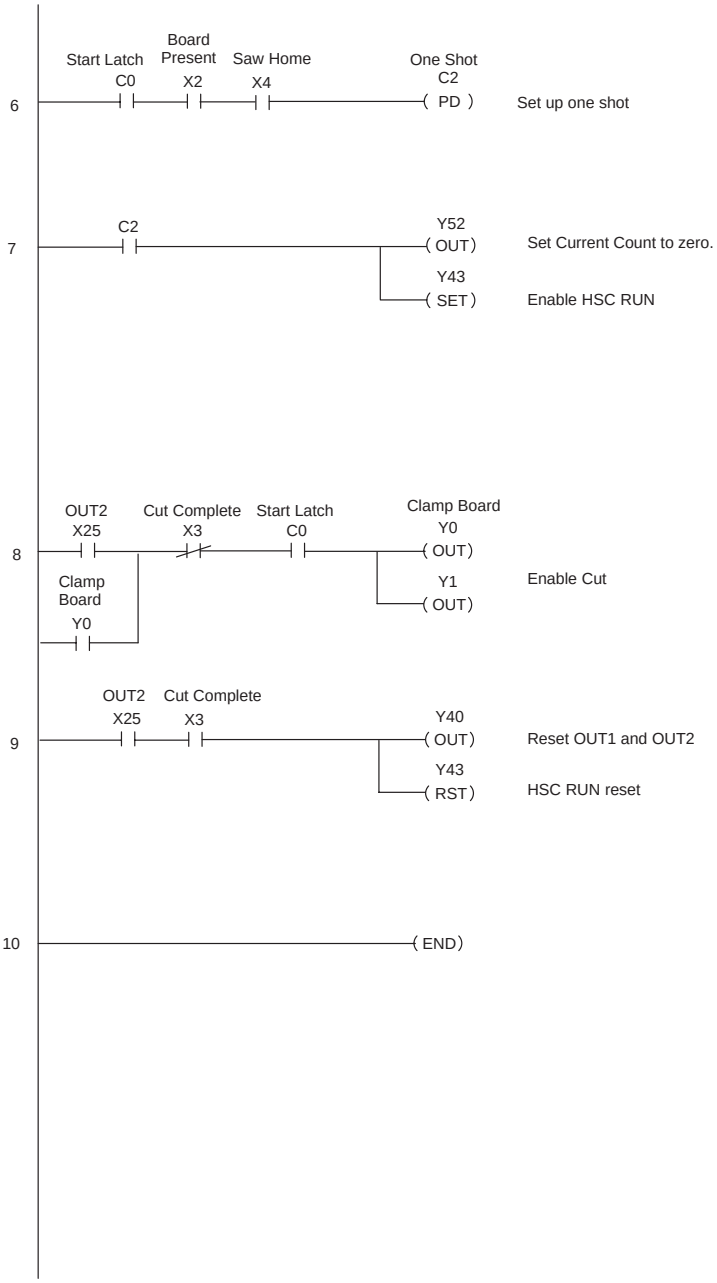


Continuation of Application No. 2

If a board is present, pulse one shot C2.



C2 will pulse Y52. clearing the current count and also setting Y43. This places the HSC in HSC RUN, allowing the HSC to automatically control the conveyor.

External output OUT1 is connected to the brake input of the drive. When the current count reaches the deceleration value, it will turn ON OUT1 which will slow the conveyor to half speed. When preset is reached OUT2 turns ON and stops the conveyor. X25 turns ON when OUT2 comes on turning ON Y0 and Y1. Y0 and Y1 clamp and cut the board. X3 turns ON when the cut is complete which releases the clamp and allows the saw to retract.

When the cut is complete, turn ON Y40 to reset the external outputs and reset Y43 to take the HSC out of HSC RUN mode.

NOTE: If a board is still present after the cut, Rungs 6 and 7 above will enable HSC RUN again to move the conveyor and make the next cut.